

Highly Sensitive Photon Counting Detectors for Deep Space Optical Communications, Phase I

Completed Technology Project (2005 - 2005)



Project Introduction

A new type of a photon-counting photodetector is proposed to advance the state-of-the-art in deep space optical communications technology. The proposed detector would operate at 1064 and 1550 nm, and combine high speed of operation with very gain and ultra low noise. The minimal expected parameters are a bandwidth of over 500 MHz (10 GHz might be possible), internal gain of over 1000 (100,000 expected), excess noise factor of less than 1.1 and count saturation rates of over 50 Mcounts/s. The detector would not require cryogenic cooling. The detectors are based on the breakthrough technology of internal discrete amplification to achieve the unparalleled combination of high gain, low noise, and high speed. This represents a radical new approach to increasing sensitivity and speed of photodetectors. The superior parameters of the proposed detectors could enable meeting the stated NASA mission goals of boosting data transfer rates in optical communication by a factor of 10-100 relative to the current state of the art. The new capabilities of the proposed detectors could lead to important advances in deep space and other optical communication systems.

Anticipated Benefits

Potential NASA Commercial Applications: In addition to deep space optical communications, the detectors could be modified for use in traditional fiber optical communications at 1.5 μ m. Because of better performance parameters, they could, for example, replace such current solutions as InGaAs avalanche photodiodes used in fiber optical telecommunications. This represents a very significant commercial market. They could also find use in commercial LIDAR applications.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

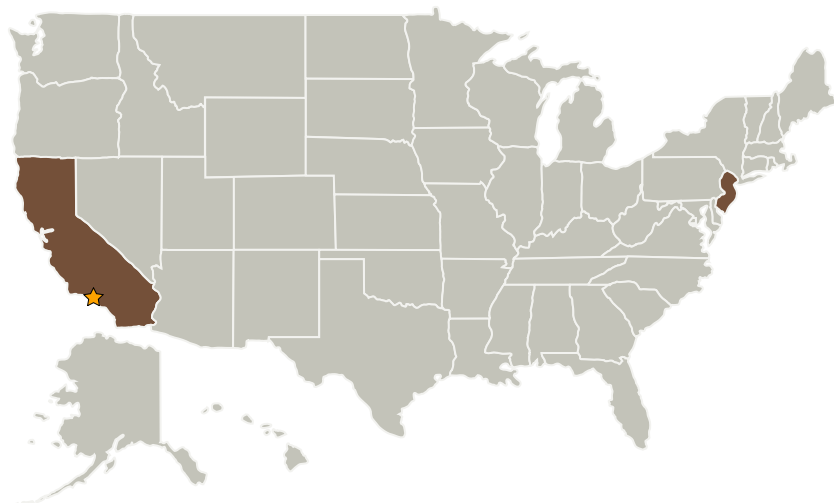
Small Business Innovation Research/Small Business Tech Transfer

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory (JPL)	Lead Organization	NASA Center	Pasadena, California
Amplification Technologies, Inc.	Supporting Organization	Industry	Paramus, New Jersey

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Alexander M Krutov

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.1 Detectors and Focal Planes

Primary U.S. Work Locations

California	New Jersey
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